Appendix 1 Liberia Obstetric Outreach Clinics: Anonymised Report to Irish Aid for year August 2022 – July 2023

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Background
A need for more clinicians trained in diagnosing and treating pregnancy and delivery complications was recognised following a countrywide assessment of health facilities in 2013. This need was greatest in the rural areas of Liberia and instigated training of obstetric skills to midwives to become obstetric clinicians after successfully completing 3 years of training in advanced obstetrics.

These midwives have had training in advanced obstetrics including managing medical conditions during pregnancy, pregnancy specific conditions, practical obstetrics, and ultrasound scanning and are identified and qualified as obstetric clinicians.

Since 2019, obstetric clinicians and a logistician have been travelling from their base hospitals to different rural clinics once a month to identify pregnant women at high risk of morbidity and mortality during labour and delivery. 'High risk' women are identified from obstetric and medical history, examination, and ultrasound scan. Women attending community outreach clinics live in remote areas and for socioeconomic reasons cannot attend central clinics or get to hospital quickly during labour.

The first county to benefit from outreach clinics was Grand Gedeh. Since then, as more obstetric clinicians were trained, and funding became available from Irish Aid, other counties having outreach clinic facilities have been River Gee, Sinoe and, this year, River Cess.

Travel to clinics
-AM the MCAI logistician for South-East Liberia, arranges the clinics attended each month.
-The Community Health Officers (CHOs) in Grand Gedeh and River Gee have intermittently agreed to provide their 4-wheel drive vehicles for Outreach clinics. MCAI pays for the fuel and washing of these vehicles.
-The obstetric clinicians in River Cess and Sinoe use motorbikes.
-The obstetric clinicians carry an ultrasound machine, and other equipment to check for early signs of pregnancy complications (blood pressure machine, urine sticks for protein and glucose as well as an emergency medical kit, containing basics for the initial management of obstetric emergencies).

Benefits of Outreach clinics
Antenatal Diagnosis
Clinical features can identify pregnant women at high risk of having complications during labour. Ultrasound scanning performed in Outreach clinic adds to the clinical diagnosis of high-risk pregnancies and can reveal potentially life-threatening obstetric disorders (eg placental pathology, malpresentations, IUFD) and manage them. Pregnant

women can also see their fetus moving, and any causes for concern can be explained, such as malpresentation and low-lying placenta.

Plan for delivery
During the clinic appointment, women can be advised on further antenatal care needed; for example, repeat ultrasound scans later in pregnancy, and advice on benefits of hospital delivery if high-risk.

If women are in late pregnancy, they can be advised to deliver in hospital if they are recognised as high risk for delivery complications. The obstetric clinician can start the consent process, discuss options for delivery, address any concerns, and arrange a date for the woman to attend the hospital, and to attend early in labour if appropriate.

If Caesarean section is recommended, obstetric clinicians can explain the benefits and risks of Caesarean section versus vaginal delivery and start the consent process well in advance of admission to hospital. If the woman needs to stay near the hospital close to term in case of complications (eg. Early labour, antepartum haemorrhage) needing an urgent Caesarean section, this can also be recommended.

There is also opportunity for future **family planning** to be discussed.

If symptoms and signs requiring urgent hospital admission are recognised, emergency treatment available in the clinic can be given and the woman transported to hospital by ambulance.

Women are identified as high risk if the following are found:

- Medical conditions for example diabetes
- Obstetric conditions for example hypertensive disorders
- Maternal age: <17yrs and >39yrs
- Grand multipara: parity > 3
- Multiple pregnancy
- Malpresentations
- Abnormal placentation
- Post maturity by women's dates and evidence on ultrasound scanning of placental calcification

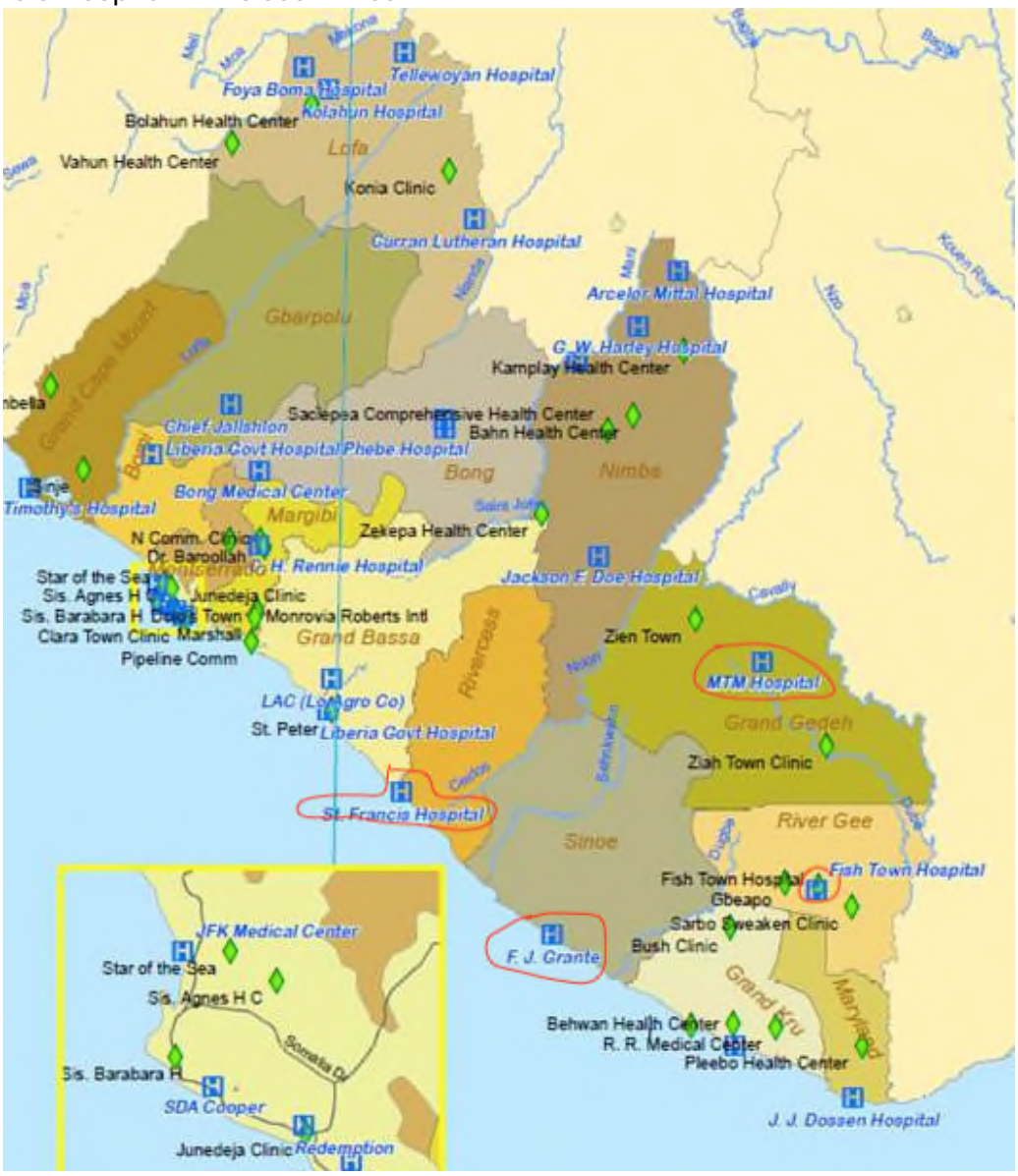
Changes were made to the criteria for high risk in the past year were:

1. Breech presentation to be considered high risk after 34 weeks' gestation. This change is because most fetuses presenting as breech before this time will be cephalic by 36 weeks' gestation. High risk is now considered at 34 weeks' gestation or later and further management noted. This accounts for the decrease in numbers of malpresentations reported this year compared with the previous report.

2. Placenta previa (low lying placenta): this condition is considered high risk if seen at or after 32 weeks' gestation because a low-lying placenta seen on ultrasound scan before this time may not be low-lying at 32 weeks' gestation. The obstetric clinicians advise

women with a low-lying placenta in the first or second trimester to be rescanned in the hospital when she reaches 32 weeks' gestation.

The map below shows the location of major hospitals in Liberia (indicated by a blue square with a 'H' inside). four counties involved in the obstetric outreach programme – Grand Gedeh, River Gee, Sinoe and River Cess. The hospitals in the four counties involved in the outreach programme are circled in red – Martha Tubman Memorial Hospital and Fish Town Hospital in the south-east and, FJ Grante Hospital and St Francis Hospital in the south west



Overview of data collected.
Combining data from Grand Gedeh, River Gee, Sinoe and River Cess counties: a total of **1619** women were seen, and **616 (38%)** identified as high risk according to the criteria. A total of **118** clinics were visited in the 4 counties.

Women assessed in Outreach clinics from September 2022 – June/July 2023

County	Base hospital	no. of women seen in outreach	no. of women identified as high risk
Grand Gedeh	Martha Tubman Memorial Hospital	544	198
River Gee	FishTown Hospital	207	56
Sinoe	FJ Grante Hospital	711	291
River Cess	St Francis or the Newly built Hospital	157	71
Total all counties		**1619**	**616 (38%)**

Data from Individual counties
(all population numbers are from the 2008 census)

Grand Gedeh: (pop: 126,146; area km^2: 10,464)

Hospital base**: Martha Tubman Memorial Hospital**
Obstetric Clinicians**: EH/ JK**
Logistician: **AM**

Clinics, number of patients seen and those identified as high risk.

Month	Clinics attended	Number of women assessed	Number of women identified as high risk
September 2022	Zai Town, Gbarzon, PTP. **3**	60	23
October 2022	Karlorwleh, Konobo, Boundary **3**	44	16
November 2022	Tuzon, Pennonken, Gborbowraga. **3**	33	13
December 2022	Boundary, Bargblor, Janzon. **3**	23	9
January 2023	Gbarzon Duogee, Toetown. **3**	88	28
February 2023	Beh, Zai, Putu Karlorwleh, Putu Jarwodee. **4**	46	15
March 2023	Konobo, Boundary, PTP **3**	66	26
April 2023	Gbarzon Polar, Gbarzon Health, Kumah. **3**	52	18
May 2023	Gborgbowrogee, Jarwodee, Pennonken. **3**	52	22

Month	Clinics attended	Number of women assessed	Number of women identified as high risk
June 2023	Bargblor, Zai, Jarzon. **3**	39	14
July 2023	Gboleken, Duogee **2**	41	14
Totals	**33**	**544**	**198 (36%)**

544 women were seen in 33 outreach clinics between September 2022 and July 2023, 198 (36%) were identified as high-risk.

143 of the women identified as high risk were grand multips, some with additional risk factors.
Other risk factors: >39yrs old 29; <17yrs old 20; multiple pregnancy 11; malpresentations 9; previous Caesarean section 9; post maturity 3; placenta previa 2.

Serious maternal complications MTMH
There was **one maternal death** in those flagged as high risk and the cause was not due to obstetric reasons. This woman was high-risk because she had 2 previous caesarean sections and was booked for a planned caesarean section. Collapse occurred almost immediately after injection of spinal anaesthetic by a very experienced anaesthetist. All attempts were made to resuscitate her, including delivery of her baby, but resuscitation was unsuccessful. The baby was healthy.

A second maternal death occurred a few days later with a similar time relationship to the spinal anaesthesia being injected. All ampoules of spinal injection in the same batch were removed from the operating theatre and replaced. There has been no further problems with spinal injections.

The ampoules were returned to the pharmacy and MOH for analysis, but the specific contents have not been analysed to my knowledge.

Case examples from EH– Grand Gedeh
[In reports below *(G – number of pregnancies, P – number of deliveries at >28 weeks' gestation, M – number of miscarriages, L – number of living children, D – number of dead children)]

Case 1 Grand Gedeh
Age > 40 years with previous caesarean section for obstructed labour and was referred to MTMH due to her age and gravidity and previous caesarean section history but didn't come until she got into labour at X clinic. Caesarean section was undertaken.

Case 2 Grand Gedeh
Patient was referred due to oblique lie with grade 2 placental calcification and has a short stature. The baby was born by Caesarean section with baby weight 3.6kg

Case 3 Grand Gedeh
Patient had previous caesarean section due to previous ruptured uterus both posterior and anterior, and 2 previous stillbirths. Patient was referred to MTMH for elective caesarean section because of previous ruptured uterus.

River Gee: (pop: 67,318, area km^2: 5,113)
Hospital base**: FishTown Hospital**
Obstetric clinician**: NJ**
Logistician: **AM**

207 women were seen in **30** outreach clinics between September 2022 and June 2023
56 (27%) women were identified as high risk.

River Gee Clinics, women assessed, high risk identified.

Month	Clinics attended	Number of women assessed	Number of women identified as high risk
September 2022	Pronoken Tuobo Jayproken. 3	26	7
October 2022	Glaro Freetown Gbeapo Putuken. 3	23	13
November 2022	Jarkaken Gmamanken Cheboken. 3	14	3
December 2022	Gbeapo Nyenanbo Glaro Ubor 3	23	7
January 2023	Jimmyville Tuobo Joelbo. 3	23	6
February 2023	Jarkaken Putuken Pronoken. 3	27	5
March 2023	Gbeapo River Gbeh Sarbo. 3	24	6
April 2023	Nyananabo Freetown Drubo 3	15	2

Month	Clinics attended	Number of women assessed	Number of women identified as high risk
May 2023	Jayproken Pronoken Jarkaken. 3	17	5
June 2023	Nyenyanken Kellipo Datuken 3	15	2
Totals	**30**	**207**	**56 (27%)**

Of those recognised as high risk, most (18) were grand multipara, there were 9 women who had malpresentations and 9 who were >40 weeks' gestation. 14 women were <17yrs old.

Four women had undergone previous caesarean sections.
Six women presented to the health centre with eclampsia or severe pre-eclampsia needing emergency treatment and transfer to hospital.

Case examples from River Gee

Case 4 River Gee
Seen in XX Health Centre in antenatal clinic at 39 weeks' gestation
History of previous intrapartum stillbirth because of difficult delivery due to large fetal size
Ultrasound findings in clinic: breech presentation, estimated fetal weight: 4.6kg. Grade 2 placental calcification.

On basis of history and findings, patient advised to be delivered by Caesarean section. Patient and relatives agreed and transfer to hospital by ambulance was arranged.
The woman was delivered Caesarean section. She experienced an immediate postpartum haemorrhage estimated at 1500ml which was treated with oxytocin infusion, misoprostol and tranexamic acid 1g.
No blood was transfused and post op Hb was 10.5g/dl (pre-op Hb was 12.5g/dl)

Case 5 River Gee
Seen in XX Clinic. She was 38 weeks' gestation in her first pregnancy. She complained of epigastric pain and her blood pressure was 169/100.
Ultrasound examination showed a twin pregnancy with both twins lying transverse.
She was given initial treatment for severe pre-eclampsia and transferred to Fishtown Hospital.
She delivered twins the following day by Caesarean section. There were no maternal complications and Hb was 12g/dl after surgery.

The babies did well and did not need to go to the neonatal unit.

Case 6 River Gee
Seen in XX Clinic. She was 42 weeks' pregnant confirmed by ultrasound scan, which showed anhydramnios, grade 3 placental calcification and an estimated fetal weight of 4.6kg.
She was transferred with her consent and had a Caesarean section the same day.
Mother and baby did well and were discharged from hospital after 4 days.

Sinoe: (pop: 104,932, area km^2: 10,137)
Hospital base: **FJ Grante**
Obstetric clinician: **OF**
Logistician**: AM**

711 women were seen in 36 outreach clinics between September 2022 and July 2023.
291 (41%) women were identified as high risk.

The numbers of women in each of the high-risk categories were:
Grand multipara = 202, age <17yrs =47, previous Caesarean section =19, Malpresentation=13
15 women seen in the clinics were treated as emergencies with eclampsia/ severe pre-eclampsia and given initial emergency treatment and transferred from clinic directly to FJ Grante Hospital

Examples of women seen in Outreach clinic

Month	**Clinics attended**	**Number of women assessed**	**Number of women identified as high risk**
September 2022	Juayen Kerquekpo Menwah Walker 3	93	33
October 2022	Butaw Wiah's Town BOPC 3	87	31
November 2022	RTM Gbason's Town Juarzon. 3	53	24
December 2022	Kwitatuzon Tubmanville Saywon Town 3	58	29
January 2023	SRC Diyangpo Government camp (2days) 4	137	46
February 2023	Kabada Panama Kilo Town Lexihtone. 4	98	45
March 2023	Edward mem Juayen Tuzon. 3	31	11

Month	Clinics attended	Number of women assessed	Number of women identified as high risk
April 2023	Jokaken Nyanwiaken Ducorfree 3	32	17
May 2023	Jacksonville Togbaville (2 days) ENI 4	43	17
June 2023	Voorgbardee Pyne's Town Pelloukon. 3	35	15
July 2023	Drapo Kabado Panama. 3	44	23
Totals	**36**	**711**	**291 (41%)**

Case 7 Sinoe
Presented at XX Health Centre at 33 weeks' gestation with a history of ruptured membranes.
Ultrasound scan confirmed severe oligohydramnios, confirmed prolonged premature rupture of membranes and fetal death.
She was transferred to hospital and delivered a stillborn baby vaginally the next day.
She received IV antibiotics.

Case 8 Sinoe
Attended the XX clinic and reported a week's history of vaginal bleeding in early pregnancy. Ultrasound confirmed retained products of conception and she was counselled and advised to go to FJ Grante Hospital for removal of retained products. She could not go because she had no money but agreed to management in the clinic.

Case 9 Sinoe
Attended XX Clinic. She was 4 weeks after her due date, and this was supported by placental calcification and oligohydramnios on ultrasound scan. She was counselled and attended hospital for induction of labour. This was followed by a live baby born by normal vaginal delivery with no postpartum complications reported.

River Cess: (pop: 65,862[1], area km^2: 5,594)
Hospital base**: St Francis**
Obstetric clinician**: AJ, LT**
Logistician: **AD**

157 women were seen in 19 outreach clinics between January 2023 and July 2023 with 71 (41%) identified as high risk.

River Cess – Clinics started Jan 2023 – women assessed and identified as high-risk

Month (2023)	**clinics attended**	**number of women assessed**	**Number of women identified as high risk**
January	River Cess Ref hosp (3 days) OBS. 4	19	7
February	Charlie Town Timbo Fen River 3	22	12
March	Gblorseo Dorbor Sayah. 3	20	13
April	Bolowhea Larkpasse Boegeezay. 3	37	25
May	Kangbo Gozhon. 2	20	8
June	Neezine ITI. 2	20	4
July	Fen River Charlie Town 2	8	1
Totals	**19**	**157**	**71 (45%)**

The numbers of women in the high risk categories were:
Grand multipara =36, age <17yrs =18, Malpresentation = 8, post maturity =8, previous Caesarean section = 5, age > 39yrs =5

Case examples from River Cess

Case 10 Rivercess
Patient attended XX Clinic at 32 weeks' gestation in current pregnancy. Advice was given to deliver in hospital because mother was grand multipara.
She attended the hospital at term. She was delivered by Caesarean section due to prolonged obstructed labour. She had a postpartum haemorrhage and was treated with oxytocin, misoprostol 800mcg and condom catheter tamponade. Mother recovered and baby had no problems.

Case 11 Rivercess
Patient a multipara presented to XX Clinic. She was 30 weeks' gestation. She was advised to come to hospital to deliver because of her parity and risk of postpartum haemorrhage.
She was in labour in the clinic and started bleeding. She had a vaginal delivery of a stillborn baby and then had a massive postpartum hemorrhage (PPH). She was transferred to hospital, was treated, and survived.

Case12 Rivercess
A young primigravida was seen in clinic and was 42 weeks into her pregnancy. Ultrasound scan showed oligohydramnios, calcified placenta and the fetus was macrosomic with an estimated fetal weight of 4.4kg. She was transferred to hospital the same day and was delivered by caesarean section 3 days later. There were no postnatal problems, and the baby was healthy.

Benefits of Outreach clinics

1 Link between hospital staff and pregnant women.
2 Link between hospital and community workers.
3 Highlight potential problems in pregnancy by clinical examination and ultrasound scanning.
4 Community nurses and midwives able to refer and discuss pregnant women they have concerns about
5 Counselling pregnant women and reinforcing need for regular antenatal clinic attendance and malaria prophylaxis.
6 Opportunity to explain individual risk to women of delivering in hospital, health centre or at home, depending on circumstances
7 Able to transfer women with antenatal complications that require emergency treatment in hospital.

Limitations of Outreach Clinics
1 limited numbers of clinics attended by an obstetric clinician – clinics are visited once or twice a year.
2 poor roads and transport to hospital for staff travelling to clinics. This occurs in all 4 counties. Some clinics in Sinoe take 2 days' travelling each way, especially those involving a river crossing.
3 For women advised to attend hospital, the situation is worse. For example, in Sinoe it may take one week in a car from the remote areas of the county to FJ Grant Hospital
4 For socioeconomic reasons, women may not be able to go to hospital. In some areas, the husband or other members of the family will be influential in the decision, the woman may have to look after other children or need to work. Financial constraints play a big part in the decision.
5 If the above barriers are overcome and a woman reaches hospital there are further obstacles before receiving appropriate treatment. If a caesarean section is recommended, the family often needs to pay for materials and drugs, and blood transfusions if donors outside the family are needed.

Summary of obstetric outreach program currently involving 1 of the 4 hospitals where fetal heart rate monitoring in labour by mothers is in place.

- Undertaken by 5 qualified obstetric clinicians in 3 counties in the most rural South-East of Liberia with support from MCAI logistician to clinics and refugee camp.
- Includes obstetric ultrasound examination for all pregnant women.
- Includes emergency kit to provide immediate investigation and treatment for emergencies such as Antepartum Haemorrhage (APH) and eclampsia or severe pre-eclampsia.

- Total Outreach to date = 1,450 pregnant women seen; total high risk 665

(Grand Gedeh October 2019 to December 2021, Rivergee July 2020 to February 2022)
Many serious previously un-recognised conditions (for examples placenta praevia, severe pre-eclampsia, multiple gestation, malpresentations, teenage pregnancies, grand multiparity,) identified, referred to hospital when appropriate and managed.

Obstetric clinicians currently attend 4 rural counties undertaking outreach antenatal clinics from their base hospitals. They are accompanied by a logistician once a month to identify antenatal women at high risk of morbidity and mortality during subsequent labour and delivery. 'High risk' women are identified from an obstetric and medical history and examination, urine testing, and when appropriate blood tests and portable battery-operated obstetric ultrasound scans.

Women attending these community outreach clinics live in remote areas and, for socioeconomic reasons, cannot reliably attend central clinics or reach hospitals in time once labour begins.

High risk categories identified at outreach include:
• Medical conditions: for example, severe untreated anaemia (often as low as 3g/dl), malnutrition, diabetes, chronic hypertension or renal impairment and heart conditions
• Obstetric conditions: for example, hypertensive disorders (pre-eclampsia and in particular severe preeclampsia and eclampsia), abnormal placentation such as placenta praevia and placental abruption, infections (chorioamnionitis and previously undetected intrauterine fetal deaths)
• Maternal age:< 17yrs and > 39yrs
• Grand multiparity
• Multiple pregnancy
• Malpresentations such as breech, transverse, and obliques presentations after 34 weeks' gestation.
• Post maturity by women's dates and evidence on USS of placental calcification and intrauterine growth retardation.

Until obstetric clinicians began visiting there had been no ultrasound facilities in the far-away remote
clinics. This development means that for the first-time pregnant women could see their alive fetus.

Potentially life-threatening disorders were managed before there were tragic consequences. Sometimes immediate treatment was needed, and women transferred by ambulance, car, or motorbike to the nearest CEmONC hospital after stabilisation such as magnesium sulphate

and hydralazine for severe preeclampsia and extremely high blood pressures, blood transfusion for severe anaemia.

***Planning for birth following obstetric outreach clinics*.**
The obstetric clinician undertaking the clinic can discuss options for delivery, answer questions and arrange a date for the woman to attend the hospital, and to attend early in labour if it begins before the date given.

This situation prepares the women for a potentially frightening experience and having contact with the same obstetric clinician when they arrive in hospital can be reassuring. If patients need Caesarean sections to help prevent maternal or fetal compromise or death, obstetric clinicians can explain why, and start the consent process in advance of admission to hospital.

If the woman needs to stay near the hospital close to delivery in case of complications needing an urgent Caesarean section (for example antepartum haemorrhage from placenta praevia), this can be stressed. It has been known on some occasions for women to stay in the obstetric clinicians' own homes before delivery if they do not know anyone living close to the hospital and cannot afford to pay for accommodation.

Breech malpresentation is a known major risk factor for birth asphyxia. Women who have been diagnosed as having breech malpresentations at or near term can be advised to deliver in hospital to help prevent birth asphyxia. If a breech is diagnosed early in the third trimester, recommendation can be made for a repeat ultrasound examination later in pregnancy to confirm or refute malpresentation.

In this program, an Obstetric Clinician equipped with an investigation and emergency treatment kit, including a portable ultrasound scanner, attends antenatal clinics to identify women with high-risk pregnancies.

The obstetric clinicians implement an appropriate clinical management plan, and crucially, ensure that each at-risk woman/ adolescent girl is followed up to ensure that they come to either the CEmONC or BEmONC facility for their continued care and delivery.

ACTION POINTS

1. MCAI to procure and ship an additional portable ultrasound scanner plus emergency diagnostic and management kit to new hospitals undertaking obstetric outreach.
2. MCAI to obtain additional small portable generators needed for keeping the ultrasound scanners charged for outreaches to the most far away clinics.
3. Ministry of Health and MCAI to identify the county transport needed safely to undertake these outreach visits.
4. Qualified obstetric clinicians to be identified and trained to undertake the outreach work based on experience in existing counties.
5. The findings on all patients seen in the clinics and their outcomes documented into logbooks (printed and electronic) connected to the MCAI database in Scotland.
6. MCAI logisticians to oversee these visits to the clinics and the data collection and transfer.

Logbook for collecting data from each patient seen in obstetric outreach work in far-away antenatal clinics.

OBSTETRIC CLINICIAN'S NAME:	PATIENT'S NAME:	DATE OF PROCEDURE:
PATIENT'S HOSPITAL NUMBER	DATE OF BIRTH OR AGE:	CLINIC
EDD GESTATIONAL AGE		PREVIOUS IUFD DETAILS INTRAPARTUM STILLBIRTH DETAILS
GRAVIDITY AND PARITY		
PREVIOUS CS	YES OR NO	IF YES GIVE DETAILS

Any abnormalities on CLINICAL examination YES OR NO

APH?	Yes/No	If Yes give details include vital signs.....
Anaemia?	Yes/No	If Yes give details.....
Blood transfusion needed?	Yes/No	If Yes give details.....
Miscarriage?	Yes/No	If Yes give details.....
Malaria?	Yes/No	If Yes give details.....
Urinary tract infection?	Yes/No	If Yes give details.....

Findings on ultrasound

Mal presentation?	Yes/No	If Yes give details.....
Multiple pregnancy?	Yes/No	If Yes give details.....
Placenta normal?	Yes/No	If Yes give details.....
Estimated fetal size and BPD	Give details.....	
Fetal abnormality?	Yes/No	If Yes give details.....
Amniotic fluid normal?	Yes/No	If NO give details.....
Fetus alive after 27 weeks?	Yes/No	If NO give details.....

Transfer of patient

Was mother transferred to hospital immediately Yes/No If Yes give details.....

Is delivery at CEmONC facility required? Yes/No If Yes give details.....

If agreed by patient? Yes/No If No give details.....
If agreed by family? Yes/No If No give details.....

Is delivery at BEmONC facility required? Yes/No